Remarks/Arguments

Reconsideration of the above-identified application in view of the present amendment is respectfully requested.

By the present amendment, claim 1 has been amended to include the limitations of claim 2 and to change the temperature at which the low-carbon steel tube yields plastically more than about 5% before fracturing from down to about -40°C to down to about -100°C. Support for the -100°C limitation can be found on page 5, lines 13 of the specification. Additionally, the dependency of claim 7 has been changed and claims 2 and 6 have been cancelled. Further, the term comprising in claim 7 has been changed to consists of.

Below is a discussion of the 35 U.S.C. §103 rejection of claims 1 to 7 in view of Japanese Patent 410140283 (hereinafter, "JP '283"), the 35 U.S.C. §103 rejection of claims 1 to 7 in view of Japanese Patent 406184635 (hereinafter, "JP '635"), and the nonstatutory double patenting rejection in view of copending application No. 10/982,517.

<u>35 U.S.C. §103 rejection in view of JP '283</u>

Claims 1 to 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over the English abstract of JP '283.

As discussed above, claim 1 was amended to include the limitations of claim 2 as well as to change the temperature at which the low-carbon steel tube yields plastically more than about 5% before fracturing from down to about -40°C to down to about -100°C. Claim 1 recites an apparatus comprising a low-carbon steel tube. The low-carbon steel tube yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low-carbon steel tube to so yield is applied to the low-carbon steel tube. The low-carbon steel tube is formed from a low-carbon steel that consists essentially of, by weight, about 0.07% to about 0.12% carbon, about 0.70% to about 1.60%

manganese, up to about 0.020% phosphorous, up to about 0.015% sulfur, about 0.06% to about 0.35% silicon, about 0.25% to about 1.20% chromium, up to about 0.65% nickel, about 0.20% to about 0.70% molybdenum, up to about 0.35% copper, about 0.02% to about 0.06% aluminum, up to about 0.05% vanadium, up to about 0.25% residual elements, and the balance iron.

Claim 1 is patentable over JP '283 because JP '283 does not teach or suggest a low-carbon steel tube that yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low-carbon steel tube to so yield is applied to the low-carbon steel tube.

The Office Action states that JP '283 in claim 6 discloses a steel tube having a composition with constituents whose weight percent ranges overlap those recited by the claims 1 to 7. Such overlap establishes a prima facie case of obviousness because it would be obvious to one of ordinary skill in the art to select the claimed alloy weight percent ranges from the broader disclosure of the prior art since the prior art teaches the same utility and similar properties of high-strength and low-temperature toughness.

JP '283 does not disclose or suggest a low-carbon steel tube that yields plastically more than about 5% before fracturing at temperatures down to about -100°C. At best, JP '283 discloses or suggests a low-carbon steel tube that yields plastically more that about 5% before fracturing at temperatures down to -40°C not at temperatures down to about -100°C.

It well known to one skilled in the art that the mechanical properties of a low-carbon steel tube (and for that matter any article formed from steel) are a function of not just the composition of the low-carbon steel, but also of the process used to form the low-carbon steel into the low-carbon steel tube. Thus, although the composition of the low-carbon steel used to form the low-carbon steel tube of the present application could potentially be prima facie obvious over a similar low-carbon steel composition, the mechanical properties of a low carbon-steel tube formed from the low-carbon steel would not.

This point is exemplified in the present application. The present application teaches two different processes for heat treating low-carbon steel tubes having similar low-carbon steel compositions. In one heat treatment process, as discussed on page 29 of the application, the low-carbon steel tube is heat treated to a temperature of about 900°C in a conventional reheating oven and then tempered to about 500°C to form a low-carbon steel tube that yields plastically at temperature down to about -40°C. In an alternate heat treatment process as discussed on page 30 of the present application, a similar low-carbon steel tube is heat treated by induction heating the low-carbon steel tube to 900°C. The induction heated low-carbon steel tube has substantially improved low-temperature properties, i.e., yields plastically at temperatures down to -100°C, even though no tempering process in performed subsequent to the induction heating process. Thus, different heat treatment processing of the low-carbon steel tubes with similar compositions yields low-carbon steel tubes with different mechanical properties. Therefore, one skilled in the art would not expect low-carbon steel tubes that have similar compositions and that are processed differently to have similar properties.

JP '283 does not teach or suggest induction heating the low-carbon steel tube only heating the low-carbon steel tube in a conventional oven and tempering the low-carbon steel tube. Thus, JP '283 does not teach or suggest a method or treatment process for forming a low-carbon steel member that yields plastically at temperatures down to about -100°C and, therefore, do not teach a low-carbon steel that yield plastically at least about 5% at temperatures down to about -100°C.

Claims 3 depends directly from claim 1 and therefore should be allowable because of the aforementioned deficiencies discussed above with respect to the rejection of claim 1 and because of the limitations recited in claims 3.

Claim 5 recites a method that comprises casting a billet of low-carbon steel. The billet of low-carbon steel has a first diameter and consists essentially of, by weight, about 0.07% to

about 0.12% carbon, about 0.70% to about 1.60% manganese, up to about 0.020% phosphorous, up to about 0.015% sulfur, about 0.06% to about 0.35% silicon, about 0.25% to about 1.20% chromium, up to about 0.65% nickel, about 0.20% to about 0.70% molybdenum, up to about 0.35% copper, about 0.02% to about 0.06% aluminum, up to about 0.05% vanadium, up to about 0.25% residual elements, and the balance iron. The diameter of the billet of low-carbon steel is reduced by hot-rolling the billet. A tube is formed having an annular wall by piercing the billet. The thickness of the annular wall is reduced to a first thickness by cold drawing the tube. The tube is heat treated after cold drawing to form a low-carbon steel tube that yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low carbon steel tube to so yield is applied to the low-carbon steel tube.

Claim 5 is patentable over JP '283 because JP '283 does not teach or suggest heat treating a low-carbon steel tube so that the low-carbon steel tube yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low-carbon steel tube to so yield is applied to the low-carbon steel tube.

JP '283, as noted in the Office Action, discloses processing seamless steel tube by forming a steel billet with a joint-less manufacturing tube method, by punching the billet, hot rolling, cold drawing, and hardening to 900°C, quenching to ambient and tempering to 500°C. JP '283 does not teach or suggest heat treating the low-carbon steel tube following cold-drawing the tube so that the tube yields plastically more than about 5% before fracturing at temperatures down to -100°C. JP '283 instead teaches heating the tube to 900°C in what appears to be a conventional heating process and then tempering to low-carbon steel tube to form a low-carbon steel tube that is ductile at -40°C. The low temperature ductility in JP' 283 is only achieved after a second tempering process not after the conventional heating process and the ductility exhibited is only indicated as being down to about -40°C not down -100°C.

Thus, JP' 283 fails to teach all of limitations of claim 5, so allowance of claim 5 is respectfully requested.

Claim 7 depends from claim 5 and further recites that the step of heat treating consists of induction heating the tube to a temperature of about 900°C and cooling the tube to room temperature.

Claim 7 is patentable over JP '283 because of the aforementioned deficiencies in the rejection discussed above with respect to claim 7. Additionally, claim 7 is patentable over JP '283 because JP '283 do not teach or suggest induction heating the tube to a temperature of about 900°C.

JP '283, as noted in the Office Action, discloses processing seamless steel tube by forming a steel billet with a joint-less manufacturing tube method, by punching the billet, hot rolling, cold drawing, and hardening to 900°C, quenching to ambient and tempering to 500°C. JP '283 does not teach or suggest induction heating the low-carbon steel tube following cold-drawing or induction heating the tube so that the tube is yields plastically more than about 5% before fracturing at temperatures down to -100°C. JP '283 instead teaches heating the tube to 900°C in what appears to be a conventional heating process and then tempering to low-carbon steel tube to form a low-carbon steel tube that is ductile at -40°C.

As discussed above, the present application discloses two distinct heat treating processes. One heat treatment process was similar to the heat treatment process in JP '283, i.e., conventional heating to 900°C and then tempering at about 500°C, and the other involved only induction heating to 900°C. It was found and noted in the present application that only when the low-carbon steel member was induction heated to about 900°C did the low-carbon steel member have substantially improved properties. It was also found that tempering step was not needed to achieve these substantially improved properties.

Thus, the method of present invention is not taught or suggested by JP'283. Additionally, there is nothing in JP '283 that would teach or suggest that induction heating and elimination of the tempering step would substantially improve the properties of the low-carbon steel member. In fact, it well settled law that the omission of an element or step and retention of the function is an indicia of unobviousness. *In re Edge*, 359 F.2d 896, 149 USPQ (CCPA 1966) (See also MPEP 2144.04 II (A and B)). Therefore, JP'283 fails to teach or suggest all the limitations of claim 7 and allowance claim 7 is respectfully requested.

35 U.S.C. §103 rejection in view of JP '635

Claims 1 to 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over the English abstract of JP '635.

As discussed above, claim 1 was amended to include the limitations of claim 2 as well as to change the temperature at which the low-carbon steel tube yields plastically more than about 5% before fracturing from down to about -40°C to down to about -100°C. Claim 1 recites an apparatus comprising a low-carbon steel tube. The low-carbon steel tube yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low-carbon steel tube to so yield is applied to the low-carbon steel tube. The low-carbon steel tube is formed from a low-carbon steel that consists essentially of, by weight, about 0.07% to about 0.12% carbon, about 0.70% to about 1.60% manganese, up to about 0.020% phosphorous, up to about 0.015% sulfur, about 0.06% to about 0.35% silicon, about 0.25% to about 1.20% chromium, up to about 0.65% nickel, about 0.20% to about 0.70% molybdenum, up to about 0.35% copper, about 0.02% to about 0.06% aluminum, up to about 0.05% vanadium, up to about 0.25% residual elements, and the balance iron.

Claim 1 is patentable over JP '635 because JP '635 does not teach or suggest a low-carbon steel tube that yields plastically more than about 5% before fracturing at temperatures

down to about -100°C when stress sufficient to cause the low-carbon steel tube to so yield is applied to the low-carbon steel tube.

The Office Action states that the English abstract of JP '635 discloses a seamless steel tube having a composition with constituents whose wt% ranges overlap those recited by claim 1-7 and the such overlap establishes a prima facie case of obviousness because it would be obvious to one of ordinary skill in the art to select the claimed alloy weight percent ranges from the broader disclosure of the prior art since the prior art teaches the same utility and similar properties of high-strength and low-temperature toughness.

JP '635 does not disclose or suggest a low-carbon steel tube that yields plastically more than about 5% before fracturing at temperatures down to about -100°C. At best, JP '635 discloses or suggests a low-carbon steel member that yields plastically more that about 5% before fracturing at temperatures down to -40°C not at temperatures down to about -100°C.

It well known to one skilled in the art that the mechanical properties of a low-carbon steel tube (and for that matter any article formed from steel) are a function of not just the composition of the low-carbon steel, but also of the process used to form the low-carbon steel into the low-carbon steel tube. Thus, although the composition of the low-carbon steel used to form the low-carbon steel tube of the present application could potentially be prima facie obvious over a similar low-carbon steel composition, the mechanical properties of a low carbon-steel tube formed from the low-carbon steel would not.

This point is exemplified in the present application. The present application teaches two different processes for heat treating low-carbon steel tubes having similar low-carbon steel compositions. In one heat treatment process, as discussed on page 29 of the application, the low-carbon steel tube is heat treated to a temperature of about 900°C in a conventional reheating oven and then tempered to about 500°C to form a low-carbon steel tube that yields plastically at temperature down to about -40°C. In an alternate heat treatment process as

discussed on page 30 of the present application, a similar low-carbon steel tube is heat treated by induction heating the low-carbon steel tube to 900°C. The induction heated low-carbon steel tube has substantially improved low-temperature properties, i.e., yields plastically at temperatures down to -100°C, even though no tempering process in performed subsequent to the induction heating process. Thus, different heat treatment processing of the low-carbon steel tubes with similar compositions yields low-carbon steel tubes with different mechanical properties. Therefore, one skilled in the art would not expect low-carbon steel tubes that have similar compositions and that are processed differently to have similar properties.

JP '635 does not teach or suggest induction heating the low-carbon steel tube only heating the low-carbon steel tube in a conventional oven and tempering the low-carbon steel tube. Thus, JP '635 does not teach or suggest a method or treatment process for forming a low-carbon steel member that yields plastically at temperatures down to about -100°C and, therefore, do not teach a low-carbon steel that yield plastically at least about 5% at temperatures down to about -100°C.

Claims 3 depends directly from claim 1 and therefore should be allowable because of the aforementioned deficiencies discussed above with respect to the rejection of claim 1 and because of the limitations recited in claims 3.

Claim 5 recites a method that comprises casting a billet of low-carbon steel. The billet of low-carbon steel has a first diameter and consists essentially of, by weight, about 0.07% to about 0.12% carbon, about 0.70% to about 1.60% manganese, up to about 0.020% phosphorous, up to about 0.015% sulfur, about 0.06% to about 0.35% silicon, about 0.25% to about 1.20% chromium, up to about 0.65% nickel, about 0.20% to about 0.70% molybdenum, up to about 0.35% copper, about 0.02% to about 0.06% aluminum, up to about 0.05% vanadium, up to about 0.25% residual elements, and the balance iron. The diameter of the billet of low-carbon steel is reduced by hot-rolling the billet. A tube is formed having an annular wall by piercing the billet. The thickness of the annular wall is reduced to a first

thickness by cold drawing the tube. The tube is heat treated after cold drawing to form a low-carbon steel tube that yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low carbon steel tube to so yield is applied to the low-carbon steel tube.

Claim 5 is patentable over JP '283 because JP '283 does not teach or suggest heat treating a low-carbon steel tube so that the low-carbon steel tube yields plastically more than about 5% before fracturing at temperatures down to about -100°C when stress sufficient to cause the low-carbon steel tube to so yield is applied to the low-carbon steel tube.

JP '635, as noted in the Office Action, discloses a process for forming a steel pipe comprising hot piercing, cold drawing, hardening, and tempering. JP '635 does not teach or suggest induction heating the low-carbon steel member following cold-drawing or induction heating the member so that the member is yields plastically more than about 5% before fracturing at temperatures down to -100°C. Thus, JP '635 fails to teach all of limitations of claim 5, so allowance of claim 5 is respectfully requested.

Claim 7 depends from claim 5 and further recites that the step of heat treating consists of induction heating the tube to a temperature of about 900°C and cooling the tube to room temperature.

Claim 7 is patentable over JP '635 because of the aforementioned deficiencies in the rejection discussed above with respect to claim 7. Additionally, claim 7 is patentable over JP '635 because JP '635 do not teach or suggest induction heating the tube to a temperature of about 900°C.

JP '635, as noted in the Office Action, discloses processing seamless steel tube by forming a steel billet with a joint-less manufacturing tube method, by punching the billet, hot rolling, cold drawing, and hardening to 900°C, quenching to ambient and tempering to 500°C. JP '635 does not teach or suggest induction heating the low-carbon steel tube following cold-

drawing or induction heating the tube so that the tube is yields plastically more than about 5% before fracturing at temperatures down to -100°C. JP '635 instead teaches heating the tube to 900°C in what appears to be a conventional heating process and then tempering to low-carbon steel tube to form a low-carbon steel tube that is ductile at -40°C.

As discussed above, the present application discloses two distinct heat treating processes. One heat treatment process was similar to the heat treatment process in JP '635, i.e., conventional heating to 900°C and then tempering at about 500°C, and the other involved only induction heating to 900°C. It was found and noted in the present application that only when the low-carbon steel member was induction heated to about 900°C did the low-carbon steel member have substantially improved properties. It was also found that tempering step was not needed to achieve these substantially improved properties.

Thus, the method of present invention is not taught or suggested by JP'635. Additionally, there is nothing in JP '635 that would teach or suggest that induction heating and elimination of the tempering step would substantially improve the properties of the low-carbon steel member. In fact, it well settled law that the omission of an element or step and retention of the function is an indicia of unobviousness. *In re Edge*, 359 F.2d 896, 149 USPQ (CCPA 1966) (See also MPEP 2144.04 II (A and B)). Therefore, JP'635 fails to teach or suggest all the limitations of claim 7 and allowance claim 7 is respectfully requested.

Double patenting rejection

Claims 1, 2, 3, and 5 have been objected to as being in conflict with respective claim 19, 21, 22, and 29 of Application No. 10/982,517. Claim 2 has been cancelled. The claims of Application No. 10/982,517 have been amended or cancelled so that claims 1, 3, and 5do not correspond. Accordingly, withdrawal of this objection is respectfully requested.

Non-statutory double patenting rejection.

Claim 1 to 7 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting.

A terminal disclaimer is attached to the application to overcome this rejection. Accordingly, withdraw of this rejection is respectfully requested.

In view of the foregoing, it is respectfully submitted that the above-identified application is in condition for allowance, and allowance of the above-identified application is respectfully requested.

Please charge any deficiencies or credit any overpayment in the fees for this amendment to our Deposit Account No. 20-0090.

Respectfully submitted,

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